PENDING CLAIMS AS AMENDED (MARKED UP VERSION)

What is claimed is:

1. [currently amended] A therapeutic delivery system comprising an implanted electrical pulse generator operably coupled with genetically engineered cells that have been transplanted into [in] a mammalian tissue, wherein said genetically engineered cells further comprise a target gene that has been operably coupled in vitro to [an] a heterologous electrically responsive promoter capable of enhancing transcription of said target gene.

2. [original] A therapeutic delivery system of claim 1 wherein the electrical pulse generator provides a subthreshold stimulation.

3. [original] A therapeutic delivery system of claim 1 wherein the electrical pulse generator provides a threshold stimulation.

4. [original] A therapeutic delivery system of claim 1 wherein the electrical pulse generator provides stimulation to the tissue from attached electrodes.

5. [withdrawn] A therapeutic delivery system of claim 1 wherein the electrical pulse generator provides stimulation to the tissue without attached electrodes using Eddy currents induced by time varying magnetic fields.

6. [withdrawn] A therapeutic delivery system of claim 1 wherein the electrical pulse generator provides stimulation to the tissue without attached electrodes using displacement currents induced by time varying electrical fields applied externally.

7. [original] A therapeutic delivery system of claim 1 wherein the electrical pulse generator is a pacemaker.

8. [original] A therapeutic delivery system of claim 1 wherein the electrical pulse generator is implanted.

9. [original] A therapeutic delivery system of claim 1 wherein the electrical pulse generator is external

10. [original] A therapeutic delivery system of claim 1 wherein the electrical pulse generator is externally controlled.

11. [original] A therapeutic delivery system of claim 1 wherein the electrical response promoter contains an electrically responsive enhancer element that is heterologous to the coding sequence.

12. [original] A therapeutic delivery system of claim 1 wherein the electrical response promoter contains an electrically responsive enhancer element heterologous to the promoter sequence.

13. [original] A therapeutic delivery system of claim 1 wherein the electrically responsive promoter is responsive to subthreshold stimulation.

14. [original] A therapeutic delivery system of claim 1 wherein the electrically responsive is responsive to threshold stimulation.

15. [original] A therapeutic delivery system of claim 1 wherein the electrically responsive promoter contains an electrically responsive enhancer element selected from the ANF 5' non-coding region.

16. [original] A therapeutic delivery system of claim 1 wherein the electrically responsive promoter comprises an ERE operably linked to a tissue specific promoter.

17. [original] A therapeutic delivery system of claim 1, wherein said promoter is a cardiac-specific promoter.

18. [original] A therapeutic delivery system of claim 17, wherein said promoter is selected from the group consisting of the ANF promoter, alpha-MHC.sub.5.5 promoter, alpha-MHC.sub.87 promoter, and human cardiac actin promoter.

19. [original] A therapeutic delivery system of claim 1, wherein said promoter is a kidney specific promoter.

20. [original] A therapeutic delivery system of claim 1, wherein said promoter is a brain specific promoter.

21. [original] A therapeutic delivery system of claim 1, wherein said promoter is selected from the group consisting of aldolase C promoter, and tyrosine hydroxylase promoter.

22. [original] A therapeutic delivery system of claim 1, wherein said promoter is a vascular endothelium specific promoter.

23. [original] A therapeutic delivery system of claim 1, wherein said electrical response promoter, or fragment thereof, is selected from the group consisting of ANF, VEGF, acetylcholine receptor, troponin, NOS3, cytochrome c, COX, CPT-1, hsp70, and skm2.

24. [original] A therapeutic delivery system of claim 1 wherein the genetically engineered cells are mammalian cells.

25. [original] A therapeutic delivery system of claim 1 wherein the genetically engineered cells are selected from the group of C2C12.

26. [original] A therapeutic delivery system of claim 1 wherein said coding sequence is selected from the group consisting of tissue plasminogen activator (tPA), nitric oxide synthase (NOS), Bcl-2, superoxide dismutase (SOD), and catalase.

27. (withdrawn) An expression vector, comprising an electrical response enhancer element, a tissue specific promoter heterologous to the element, and a coding sequence, wherein said promoter is operably linked to said coding sequence and said element is effective to cause expression of said coding sequence.

28. (withdrawn) An expression vector of claim 27, wherein said expression vector is a plasmid.

29. (withdrawn) An expression vector of claim 27, wherein said expression vector is an adenovirus vector.

30. (withdrawn) An expression vector of claim 27, wherein said expression vector is a retrovirus vector.

31. (withdrawn) An expression vector of claim 27, wherein said coding sequence is a viral thymidine kinase coding sequence.

32. (withdrawn) An expression vector of claim 31, wherein said viral thymidine kinase coding sequence encodes herpes simplex viral thymidine kinase.

33. (withdrawn) An expression vector of claim 27, wherein said coding sequence encodes luciferase.

34. (withdrawn) An apparatus for testing cells comprising an upper plate electrode, a lower plate electrode, and a porous membrane which is positioned between said upper and lower plate electrodes during operation.

35. (withdrawn) An apparatus of claim 34 wherein the upper plate electrode is the same size as the lower plate electrode.

36. (withdrawn) An apparatus of claim 34 wherein the lower plate electrode forms a receiving means for the porous membrane.

37. (withdrawn) An apparatus of claim 34 wherein the porous membrane supports cells between said upper and lower plate electrodes.

38. (withdrawn) An apparatus of claim 34 which is operably coupled to a pulse generator.

39. [currently amended] A method of treating a patient comprising providing the patient with a implantable electrical pulse generator operably coupled with genetically engineered cells that have been transplanted into [in] a patient tissue, wherein said genetically engineered cells further comprise a target gene that has been operably coupled in vitro to [an] a heterologous electrically responsive promoter capable of enhancing transcription of said target gene.

40. [currently amended] A method providing a patient with a implantable electrical pulse generator operably coupled with genetically engineered cells that have been transplanted into [in] a patient tissue, wherein said genetically engineered cells further comprise a target gene operably coupled in vitro to [an] a heterologous electrically responsive promoter capable of enhancing transcription of said target gene.

41. [canceled] A genetically engineered cell of claims 1, 39 or 40]wherein genetically engineered cells a transplanted into the patient tissue.

42. [canceled] A method of either claims 1, 39 or 40 wherein genetically engineered cells are obtained by transfecting the cells of the patient tissue.

43. [original] A therapeutic delivery system of Claim 1 [method of either claims 1, 39 or 40] wherein the transfected tissues are independently selected from, epithelial tissue, endothelial tissue, or mesodermal tissue.

44. [currently amended] A therapeutic delivery system of Claim 1 [genetically engineered cell of claims 1, 39, or 40] wherein the genetically engineered cells are independently selected from the group consisting skeletal muscle cells, heart muscle cells, smooth muscle cells,

pluripotent stem cells, mesodermal stem cells, myoblast, fibroblasts, cardiomyoctes, cholinergic neurons, [andrenergic]adrenergic neurons, and peptidergic neurons, [gial]glial cells, astrocytes, [oligodendrytes]oligodendrocytes, schwann cells, [vascualr]vascular endothelial cells, [synopvial]synovial cells, acinar cells, hepatocytes, chondrocytes, osteoblasts, osteoprogenitor cells, [nucleous]nucleus pulposus cells, and cells of the intervertebral disk.

45. [new] A method of treating a patient of Claim 39 wherein the transfected tissues are independently selected from, epithelial tissue, endothelial tissue, or mesodermal tissue.

46. [new] A method of treating a patient of Claim 39, wherein said genetically engineered cells are independently selected from the group consisting skeletal muscle cells, heart muscle cells, smooth muscle cells, pluripotent stem cells, mesodermal stem cells, myoblast, fibroblasts, cardiomyoctes, cholinergic neurons, adrenergic neurons, and peptidergic neurons, glial cells, astrocytes, oligodendrocytes, schwann cells, vascualr endothelial cells, snopvial cells, acinar cells, hepatocytes, chondrocytes, osteoblasts, osteoprogenitor cells, nucleus pulposus cells, and cells of the intervertebral disk.

47. [new] A method of treating a patient of Claim 40 wherein the transfected tissues are independently selected from, epithelial tissue, endothelial tissue, or mesodermal tissue.

48. [new] A method providing a patient with an electrical pulse generator operably coupled with genetically engineered cells in a patient tissue of Claim 40, wherein the genetically engineered cells are independently selected from the group consisting skeletal muscle cells, heart muscle cells, smooth muscle cells, pluripotent stem cells, mesodermal stem cells, myoblast, fibroblasts, cardiomyoctes, cholinergic neurons, adrenergic neurons, and peptidergic neurons, glial cells, astrocytes, oligodendroytes, schwann cells, vascular endothelial cells, synovial cells, acinar cells, hepatocytes, chondrocytes, osteoblasts, osteoprogenitor cells, nucleous pulposus cells, and cells of the intervertebral disk.